CHAPTER 9

Information Failures in Health Care

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Introduction

Health care failures, or clinical adverse events, have become highly topical both in the popular media and in professional and clinical journals. On the basis of several large-scale studies, researchers have estimated that 3 percent to 10 percent of inpatient admissions resulted in some form of medically related injury, one-third to one-half of which were preventable (Baker, Norton, Flintoft, Blais, Brown, Cox, et al., 2004; Brennan, Leape, Laird, Hébert, Localio, Lawthers, et al., 1991; Leape, Brennan, Laird, Lawthers, Localio, & Barnes, 1991; Thomas, Studdert, Burstin, Orav, Zeena, Williams, et al., 2000; Vincent, Neale, & Woloshynowycz, 2001). Kohn, Corrigan, and Donaldson (1999, p. 24) define “adverse events” as injuries caused by medical management rather than the underlying condition of the patient. For example, major public inquiries in the U.K. (Bristol) and Canada (Winnipeg) have provided detailed accounts of how failures in several health care organizations contributed to significant adverse events—in these instances, the deaths of children undergoing cardiac surgery (Kennedy, 2001; Sinclair, 2000). The issues identified in both of these inquiries may be illustrative of the more widespread problems signaled by the large studies. The testimony given in both inquiries made it painfully clear that adverse events have a devastating impact on all those involved, including not only patients and family members, but also health care providers and health care organizations.

It is also evident from the testimony and final reports from Winnipeg and Bristol that there were failures in the way that the organizations handled information that might have prevented or at least minimized the problems. The aim of this chapter is to highlight the multifaceted role information failures can play in clinical adverse events and patient safety. We use themes based on the Winnipeg and Bristol reports to structure an overview of the interdisciplinary concepts that researchers have used to study health care failures and issues having to do with information handling and management. The themes include culture (organizational, professional, safety, and information); incident reporting and
safety monitoring; human factors analysis and systems thinking; and resilience and learning from adverse events in complex environments.

Patient safety can be defined as "the reduction and mitigation of unsafe acts within the health care system, as well as through the use of best practices shown to lead to optimal patient outcomes" (Davies, Hébert, & Hoffman, 2003, p. 12). The emphasis on learning and prevention has prompted calls for improved organizational and safety cultures (Battles & Lilford, 2003; Walshe & Shortell, 2004). Safety culture has been equated with an "informed culture" (Hudson, 2003; Reason, 1997, 1998; Toft & Reynolds, 1994). Both the Sinclair (2000) and Kennedy (2001) reports point to the cultures of the respective health care organizations as factors contributing significantly to the tragic outcomes.

Researchers interested in preventing patient safety failures in hospitals have turned to studies of accidents and disasters in complex environments for insights (Gaba, 2000; Hudson, 2003; Rosenthal & Sutcliffe, 2002; Schulman, 2002; Weick, 2002). Information failures have been cited as a major contributing factor to, and preconditions of, organizational disasters and accidents (Horton & Lewis, 1991; Pidgeon & O'Leary, 2000; Reason, 1997; Toft & Reynolds, 1994; Turner & Pidgeon, 1997; Vaughan, 1996). In these studies, examples abound of missed or ignored warning signals and failure to handle information in ways that could have prevented adverse outcomes. This research, in particular the work of Turner (1976), Turner and Pidgeon (1997), Westrum (1987, 1992, 2004), and Vaughan (1999), raises the interesting possibility that underlying ways of shared thinking, or culture, and related information practices may make it more difficult for an organization to handle information about errors and failures effectively. Horton and Lewis (1991, p. 204) label these phenomena "dysfunctional information attitudes and behaviors." Examples of these types of information breakdown are found in the two inquiry reports and will receive further discussion.

As Sophar (1991, p. 151) notes, "Not all disasters are spectacular. Many, such as environmental and information disasters, are usually the accumulation of many smaller ones." Common concepts and patterns emerge from the study of the diverse mishaps and events covered in the literature (Horton & Lewis, 1991; Turner & Pidgeon, 1997). The events involve people in organizations engaged in activities potentially linked to risks or hazards that could cause injury or damage. The common thread of these elements is present in Turner and Pidgeon's (1997, p. 70) definition of disaster as "an event, concentrated in time and space, which threatens a society or a relatively self-sufficient subdivision of society with major unwanted consequences as a result of the collapse of precautions which had hitherto been culturally accepted as adequate." Studies of how such precautions fail or succeed in organizations have spawned several theoretical approaches (Rijpma, 1997, 2003), including Turner's (1976) disaster incubation theory, Normal Accident Theory (Clarke & Perrow, 1996; Perrow, 1999a, 1999b), and High Reliability
Theory (LaPorte & Consolini, 1991; Roberts, 1990, 1993; Rochlin, 1999; Weick & Roberts, 1993). We will highlight these approaches and consider how they contribute to understanding the role of information failures in patient safety failures.

Given the breadth of this subject area and the potential for linkages to many topics, it should be noted that we offer just one of many possible paths through the literature. This chapter is not intended to be an all-encompassing review, but rather to illustrate possibilities and connections. For useful background reading on organizations as information environments and organizational information processing, see Sutcliffe (2001) and Choo (1998, 2002).

By way of background, the next section will provide a brief summary of the situations that gave rise to the Manitoba inquest and Bristol inquiry.

The Inquiries into Pediatric Cardiac Surgery
Deaths in Winnipeg and Bristol

The inquest headed by Mr. Justice Sinclair (2000) looked into circumstances surrounding the deaths of 12 children who had undergone cardiac surgery at the Winnipeg Health Sciences Centre in 1994. The hearings began in 1995 and ended in 1998, resulting in 50,000 pages of transcripts and 10,000 pages of exhibits. The inquest found that five of the deaths were preventable and several more possibly could have been prevented (Sinclair, 2000, p. vi). It also found that the parents of the children were not adequately informed about the inexperience of the surgeon or the risks of the surgery (Sinclair, 2000, p. 480). The procedures had been carried out by a new junior surgeon, who had been recruited to restart the pediatric cardiac surgery program after it had been suspended when the previous surgeon had left. The report indicated that some of the issues related to the skills and abilities of particular individuals, but "other problems were largely systemic in nature" (Sinclair, 2000, p. 465). The surgeries took place in a context beset by problems, including a shortage of cardiologists in the program; inadequate supervision and lack of a phased start-up plan; poor case selection; confusion over lines of authority; and poor leadership, team relations, and communication. The report identified failures in monitoring the program and in both internal and external quality assurance mechanisms. It also pointed out that insufficient attention was paid to individuals (nurses and anesthetists) who raised concerns about the surgical outcomes and especially condemned the treatment of the nurses in this regard (Sinclair, 2000, p. 477). The report noted that poor outcomes were rationalized as part of the "learning curve" to be expected as the new surgeon and surgical team gained experience (Sinclair, 2000, p. 473). Due to the systemic failures, there were delays in dealing with problems related to the team's performance. The report recommended that the
program resume only as part of a regional program because of the concern that the number of patients in the province of Manitoba alone would be insufficient to allow it to develop fully, a situation that could increase the risk of deaths and complications (Sinclair, 2000, p. viii).

Shortly after the Sinclair report was published in 2000, Learning from Bristol, the report of the inquiry into children’s heart surgery at the Bristol Royal Infirmary (BRI), was released (Kennedy, 2001). The time frame and scope were significantly larger, in that the review covered the care given to complex pediatric cardiac patients—over 1,800 children in all—between 1984 and 1995. The review dealt with over 900,000 pages of documents. The Bristol Inquiry was not charged with investigating causes of individual deaths but looked at the adequacy of services and whether appropriate action had been taken in response to concerns about the surgeries (Kennedy, 2001, p. 1). The inquiry found that one-third of the children who had undergone open-heart surgery received “less than adequate care” and, further, that between 1991 and 1995, the mortality rate was higher than expected for comparable units at the time, resulting in 30 to 35 more deaths in children under the age of one (Kennedy, 2001, p. 241). Given that BRI did not have a full-time pediatric surgeon on its staff, the children’s procedures were carried out by two surgeons who operated primarily on adults. The pediatric patients received care in the adult intensive care unit, there were inadequate numbers of pediatric nurses, and the service was split between two sites. Because of problems with the physical plant and concerns about inadequate numbers of patients, it had been debated whether BRI should at all have been designated as a pediatric cardiac surgery center. Once again, there were findings of individual failings, but systemic issues were dominant. These related to hierarchical culture and lack of teamwork; poor organization, communication, and leadership; and inadequate resources and staffing. Parents of the children were not informed adequately about the risks nor were they given enough time to consider what they were told, prompting the observation that “sharing of information should be a process” (Kennedy, 2001, p. 220). Over the course of several years, an anesthetist who joined the hospital in 1988 raised concerns about the length of procedures and their outcomes. The report chronicled his efforts to bring the data he had compiled to the attention of various individuals, but these efforts did not result in effective action for a considerable time (Kennedy, 2001, pp. 134–151). The lines of accountability and responsibility for monitoring were confused, both internally and externally. The culture was described as one in which data about bad results were variously explained by the learning curve (Kennedy, 2001, p. 247), the complicated case mix (Kennedy, 2001, p. 161), a run of bad luck, or the small numbers skewing the percentages. The broader context also contributed to the “wishing away” of the problems; “the tradition in the NHS of overcoming the odds drowned out any messages that things were worse than they should be” (Kennedy, 2001, p. 247).
There are striking parallels between the Winnipeg and Bristol inquiries and the two resulting reports. It is a compelling coincidence that two such similar inquiries with overlap in circumstances, mandates, and time frames occurred in separate countries. The fact that they arrived at similar recommendations supports the wider applicability of the lessons learned from these cases.

Each of the institutions involved was staffed by well-intentioned, hard-working but in some instances misguided health care professionals. Both reports emphasized the importance of taking systems and human factors approaches to identify issues rather than blaming individuals and instilling fear (Kennedy, 2001, pp. 4, 258; Sinclair, 2000, p. 488). They described flawed systems, with lack of leadership and teamwork, and confusion over lines of authority and responsibility for monitoring. Although Bristol "was awash with data," these had been handled in a fragmented way and thus had been open to varying interpretations and challenges (Kennedy, 2001, pp. 240–241). By contrast, Winnipeg had inadequate data and "no tracking of common indicators that might point to matters of concern" (Sinclair, 2000, p. 484). However, in both cases the reports found that information and concerns about the problems had been explained away, not fully understood, discounted, ignored, or had fallen through cracks within the organizations (e.g., Kennedy, 2001, p. 247; Sinclair, 2000, p. 233). Consequently, among the many recommendations made in each report, particular emphasis was placed upon the need to change the cultures of health care organizations so as to promote open sharing and learning from errors, near-misses, and incident reporting.

In the sections that follow, we take a closer look at themes reflected in the Winnipeg and Bristol reports: culture (organizational, professional, safety, and information), human factors analysis and systems thinking, and incident reporting and safety monitoring. Connections also are made to the notion of resilience and the ability to recover from errors (Kennedy, 2001, p. 359; Sinclair, 2000, p. 497), topics that have been a focus in learning from adverse events in complex environments. We highlight the literature relevant to each topic, with illustrations from the two inquiry reports.

Cultures—Organizational, Professional, Safety, and Information

Culture is a recurrent theme in both the Winnipeg and Bristol reports, although variations on the term show up much more frequently in Bristol (over 180 instances in the 530-page final report). By sheer weight of emphasis, the Bristol Inquiry clearly accorded the concept a great deal of importance. The report defines culture as "the attitudes, assumptions and values of the NHS and its many professional groups" (Kennedy, 2001, p. 264), "which condition the way in which individuals
and organizations work" (Kennedy, 2001, p. 266). It is "the way things are done around here" (Kennedy, 2001, p. 264). The definitions are in keeping with those given by Schein (1992) and Denison (1996) in the context of organizational studies literature. Denison (1996, p. 624) describes culture as

the deep structure of organizations, which is rooted in the values, beliefs, and assumptions held by organizational members. Meaning is established through socialization to a variety of identity groups that converge in the workplace. Interaction produces a symbolic world that gives culture both a great stability and a certain precarious and fragile nature rooted in the dependence of the system on individual cognition and action.

Denison (1996) points out that researchers have described three levels of cultural phenomena: a surface level, which includes artifacts, symbols, and practices; an intermediate level, which includes values and traits; and a deep level, composed of assumptions. This reflects Schein's (1992) categorization of levels. The notions of "identity groups," "socialization," and "assumptions" present in Denison's definition share roots with Schein's (1992, p. 12) much-quoted definition of the culture of a group:

A pattern of shared basic assumptions that the group learned as it solved its problems of external adaptation and internal integration that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems.

Schein's emphasis on the role of leaders in creating and managing culture has been criticized as perhaps too narrow and overly functionalist in outlook (Alvesson, 1993; Martin, 1992; Schultz, 1994). However, the emphasis on problem solving has been taken up by other organizational researchers, such as Westrum (2004).

Assumptions are part of the third, deeper level of culture, and tend to be the unquestioned beliefs that unconsciously guide actions. As such, they are very difficult to uncover and change, due to the defensive routines that members invoke when challenged or threatened (Argyris & Schön, 1996).

The complexity of culture as a concept is underscored by the variety of ways in which the term is used in the Bristol report. The term serves to call attention to values and attitudes to which the organization and health care system should aspire—for example, a culture of quality, safety, flexibility, openness, accountability, and public service (Kennedy, 2001, p. 13); culture of teamwork (Kennedy, 2001, p. 276); and culture of
high performance (Kennedy, 2001, p. 276). The report depicts the inadequacies of the organization and system (as they were prior to the inquiry) by presenting a distressing litany of values and attitudes, including culture of blame (Kennedy, 2001, p. 16); club culture (Kennedy, 2001, p. 2); over-reliance on an oral culture (Kennedy, 2001, p. 37); culture of medicine (territorial) (Kennedy, 2001, p. 161); management culture of fear (Kennedy, 2001, pp. 171, 201); a culture that excluded nurses (Kennedy, 2001, p. 176); culture of the NHS (chapter 22), with its prevailing culture of blame and stigma (Kennedy, 2001, p. 259); culture of defensiveness (Kennedy, 2001, p. 272); culture of uncertainty (in contrast to accountability) (Kennedy, 2001, p. 273). Even the ostensibly positive mend-and-make-do culture and culture of pragmatism (Kennedy, 2001, p. 274) were found to have contributed to the problems.

In the text of the Winnipeg final report, on the other hand, the word “culture” does not appear until chapter 10 (Findings and Recommendations). Yet, although he makes only sparing use of the term, Sinclair (2000, p. 492) forcefully states that

[t]he [Health Sciences Centre] must develop an institutional culture in which information about safety hazards is actively sought, messengers are trained to gather and transmit such information, and responsibility for dealing with that information is shared by all. This will require new approaches to quality assurance, risk management and team performance.

Echoing these comments from Winnipeg, Kennedy’s (2001, p. 16) recommendations call for the development of a culture of safety:

A culture of safety in which safety is everyone’s concern must be created. Safety requires constant vigilance. Given that errors happen, they must be analyzed with a view to anticipate and avoid them. A culture of safety crucially requires the creation of an open, free, non-punitive environment in which health care professionals can feel safe to report adverse events and near misses (sentinel events).

The quoted recommendations weave together aspects of professional, safety, and information cultures. In the following sections we give an overview of some of the related literature that explains how traditional characteristics of professional cultures have made it difficult to achieve the informed safety cultures advocated by the Winnipeg and Bristol reports.

**Professional Cultures and Subcultures**

Denison (1996, p. 635) states that the social constructivist perspective of culture emphasizes the “recursive dynamics between the individual
and the system." As individuals are socialized to various identity groups, multiple subcultures may develop (the differentiation perspective of cultures) rather than a single unified or homogenous organizational culture (the integration perspective) (Martin, 1992). Martin describes a third possibility, the fragmentation perspective, which emphasizes ambiguity as the dominant aspect of a culture. Health care organizations are the workplace for many occupational communities; as a result, they harbor a kaleidoscope of distinct and overlapping work cultures.

Van Maanen and Barley (1984, p. 287) refer to occupational communities as groups of people who consider themselves to be engaged in the same sort of work; whose identity is drawn from the work; who share with one another a set of values, norms, and perspectives that applies to but extends beyond work-related matters; and whose social relationships meld work and leisure. In their analysis of work culture, they consider task rituals, standards for proper and improper behavior, and work codes for routine practices, as well as the occupational group's "compelling accounts attesting to the logic and value of these rituals, standards, and codes" (Van Maanen & Barley, 1984, p. 287). They note that occupational communities strive for control over the way their work is done, how it is evaluated, and who may enter the community.

Schein (1996) identifies and describes three different cultures operating silently within an organization: the operators, the engineers, and the executives. In health care, strong professional subcultures and markedly different worldviews influence decision making and information practices (Davies, Nutley, & Mannion, 2000; Walshe & Rundall, 2001). Bloor and Dawson (1994) suggest that their diverse values and practices help professionals make sense of and manipulate events, possibly as a way to maintain or improve their status or position relative to other groups in the organization. According to Alvesson (1993, p. 117), "Given cultural differentiation, values and ideals will be implemented to different degrees depending on the issue and the amount of influence a particular group has. Compromise, tension, and even conflict can be expected." Traditionally, the medical profession has been dominant in health care, although physicians' position of power and authority as a "sovereign profession" has been eroded somewhat by the rise of corporate medicine, as chronicled by Starr (1982, p. 1).

The culture of a profession, including its long-held beliefs and practices, can be at odds with broader organizational goals and environmental changes. For example, learning and improvement require team skills and understanding of patient care as multidisciplinary processes embedded in complex systems (Feldman & Roblin, 1997; Leape & Berwick, 2000; Nolan, 2000). West (2000) suggests that the increasing specialization of health care professionals over time has contributed to compartmentalization of knowledge and information, which Vaughan (1996, p. 62) refers to as "structural secrecy." This view is further reinforced by West's (2000, p. 123) finding that "nurses and doctors rarely discuss important professional matters informally with each other. ... These
boundaries, around medicine in particular, could be a barrier to communication with, and monitoring by, other professional groups” (see also West, Barron, Dowsett, & Newton, 1999). In her thoughtful analysis of the neglect of the nurses’ concerns in Winnipeg, Ceci (2004) draws on insights from Foucault for one explanation of why this happened. She suggests that social norms and rules constitute and privilege some knowledge claims as more credible than others: “[n]urses, it seems, before they even spoke, were confined within already existing relations of power and knowledge that determined them to be, that positioned them as, the sorts of persons whose concerns need not be taken seriously” (Ceci, 2004, p. 1884).

The norm of hierarchical organization among health care professionals can result in reporting relationships impaired by too great an adherence to an authority gradient. Nurses and junior medical staff are not in a position to challenge physicians’ erroneous judgment calls; as a consequence, communication and collaboration may be undermined (Sexton, Thomas, & Helmreich, 2000; Thomas, Sexton, & Helmreich, 2003). Davies, Nutley, and Manion (2000, p. 113) observe that “health care is notoriously tribal,” as can be seen in the rivalry, competition, and discordant subcultures found in some organizations. Given these factors, teamwork in health care may sometimes seem like an oxymoron. This is in keeping with the observation from Bristol that

complexity lies in the coexistence of competing cultures. This is very much the case within the NHS, where the cultures, for example, of nursing, medicine, and management are so distinct and internally closely-knit that the words ‘tribe’ and ‘tribalism’ were commonly used by contributors to the Inquiry seminars on this subject. (Kennedy, 2001, p. 266)

Both inquiries condemned the traditional disciplinary hierarchy and its impact on communication. “The continued existence of a hierarchical approach within and between the healthcare professions is a significant cultural weakness. ... This sense of hierarchy also influences who gets listened to within the organization when questions are raised” (Kennedy, 2001, pp. 268-269).

Physicians have traditionally been seen as independent contractors and the “captain of the ship,” an image that has encouraged perpetuation of a myth of medical infallibility (Helmreich & Merritt, 1998; Weick, 2002). In the Winnipeg inquest, Sinclair (2000, p. 485) bluntly criticized this aspect of medical culture, which, in his words,

reflected the concept of the surgeon as the supreme and infallible captain of the ship. This meant that what should have been the collective concern about the team’s ability to handle certain cases turned into highly charged conflicts centering on the surgeon.
Sharpe (1998, p. 17) traces the historical roots of this view of the medical profession in North America, stating that

[T]he dominant view of medical error and ways in which it is institutionalized presupposes, expresses, and reinforces the assumption that medical quality itself is essentially a function of the competence and integrity of individuals and that error prevention, therefore, is largely about their technical and moral improvement.

As a result, Sharpe notes, the litigating public has been quite willing to embrace this view and hold individual physicians accountable through lawsuits for adverse outcomes that they have suffered. The combined effect of professional culture and societal culture appears to be circular and self-amplifying. Physicians have generated a culture of independence with a belief in individual, not system, causes of human error (Bosk, 1979). Patients sue to hold them accountable for adverse outcomes, even if these may be the result of multiple systemic causes. The physicians become more wary of litigation and less likely to engage in the open reflection required for learning, for fear of producing data that may be used as evidence against them. Consequently, analyses of root causes are not pursued, learning does not take place, adverse outcomes continue, and the cycle goes on. To help break this vicious cycle, the Bristol report recommended that clinical negligence be abolished and replaced with an alternate system to provide compensation to patients injured by clinical adverse events (Kennedy, 2001, p. 16).

**Safety Culture**

Safety implies preventing adverse events, and the occurrence of adverse events is used as a safety indicator, the one being the converse of the other (Flin, Mearns, O’Connor, & Bryden, 2000; Mearns & Flin, 1999). However, Hale (2000, p. 10) voices a note of caution about applying lessons learned from the retrospective identification of cultural factors implicated in adverse events, a process that involves “tracing causal chains into the past.” It is still difficult to know which specific cultural factors to measure in order to assess safety in organizations, as there may be widely varying combinations that constitute lethal time bombs. Despite this caveat, Pidgeon (1991, p. 131) suggests that “the notion of safety culture may provide at least heuristic normative guidance for ongoing management and control of risk.”

Turner (1991, p. 241) has defined safety culture as “the specific set of norms, beliefs, roles, attitudes and practices within an organization which is concerned with minimizing exposure of employees, managers, customers, suppliers, and members of the general public to conditions considered to be dangerous or injurious.” This definition is comparable to many other definitions of culture, such as that of Hale (2000, p. 7),
who refers to "the attitudes, beliefs, and perceptions shared by natural
groups as defining norms and values, which determine how they act and
react in relation to risks and risk control systems." Gherardi and
Nicolini (2000) made use of Lave and Wenger's (1991) notion of commu-
nities of practice to study how members learn about safety practices in
the workplace and how the learning process shapes safety cultures.
According to Gherardi and Nicolini (2000, p. 13), "knowing is a contested
and negotiated phenomenon," a characterization that echoes Turner and
Pidgeon's (1997, p. 188) notion of a "distinctive organizational discourse
about 'the way safety is handled around here.'" As noted earlier, Ceci
(2004) would agree that knowing is contested, but her study indicated
that the power structures in health care organizations do not allow some
of the members much latitude to negotiate. Gherardi, Nicolini, and
Odella (1998, p. 211) found that safety cultures vary by different groups
or communities of practice; as suggested by the two inquest reports, this
may be the case in health care organizations as well:

Dispersed communities have diverse and non-overlapping
organizational information, world-views, professional codes,
organizational self-interests, and different interpretations of
what is happening, why it is happening, and what its implica-
tions are. ... The limits on safety derive from the isolation of
potentially dissenting points of view, but simultaneously learn-
ing about safety occurs because learning is mediated by differ-
ences of perspective among co-participating communities.

For an extensive discussion of the literature relating to communities
of practice, see Davenport and Hall (2002).

Mearns and Flin (1999) also emphasized the need to understand how
a shared view of safety is constructed through the interaction among the
members of an organization. Richter and Koch's (2004) case study of
safety cultures in Danish companies has built on Martin's (1992, 2002)
and Alvesson's (1993, 2002) conceptual approaches to organizational
culture. Richter and Koch use the metaphors of "production," "welfare," and
"master" to characterize the multiple safety cultures they observed in
one company. The production metaphor emphasizes the view that risks
are an acceptable part of work and can be minimized by the workers.
What counts is productivity, and safety measures get in the way. The
welfare metaphor stresses that risks are unacceptable and can jeopar-
dize workers' long-term participation as productive members of society.
Safe technology and social practices can prevent accidents (Richter &
Koch, 2004, p. 713). The master metaphor stresses that risk taking is
unacceptable. It emphasizes the safe mastery of the trade through learn-
ing from good examples modeling habits of risk avoidance (Richter &

Flin et al. (2000) state that discussions of safety culture and climate
in published studies generally focus on such dimensions as members'
perceptions of management and supervision, safety systems and arrangements, risk, work pressures, competence, and procedures. A subset of this cluster of factors is the way that responsibility and blame are handled. Safety researchers point out that the most common reaction in an organization is to focus on the actual event itself and the immediate response is to find responsible culprits to blame (Berwick, 1998b; Cook, Woods, & Miller, 1998; Reason, 1997, 1998; Sharpe, 1998). This is in keeping with anthropologist Mary Douglas's (1992, p. 19) wry observation that the culture of the organization will govern what will count as information and that "blaming is a way of manning the gates through which all information has to pass." If prevailing hospital values are perceived to favor learning and prevention of future mistakes through human factors analysis of error, this may influence how staff expect to be treated when adverse events happen and how they react in the future to information about adverse events. If the prevailing values and practice lean toward holding individuals accountable and placing blame, mistakes may be seen as an occasion for fear and less open communication (Hofmann & Stetzer, 1998; Nieva & Sorra, 2003): "in the politics of blaming, information is tailored to be ammunition" (Hart, Heyse, & Boin, 2001, p. 184). The Kennedy and Sinclair reports explicitly emphasized the need for human factors and systems approaches both for their own analyses of events, as well as for ongoing learning in the health care organizations (Kennedy, 2001, pp. 182, 256; Sinclair, 2000, p. 488). By avoiding inappropriate fault-finding and blame, organizations can encourage staff to report the incidents and near-misses that are crucial for review and learning.

**Information Culture and Safety Culture**

In the Winnipeg report, Sinclair (2000, p. 492) emphasized the need for a culture that actively supports the seeking and use of information about safety hazards. Likewise, Kennedy (2001, p. 366) wrote that improvement of safety requires creation of "an environment of openness so as to give rise to a systematic flow of information." The importance of information has also been underscored in the research literature linking safety and culture: "Failures in information flow figure prominently in many major accidents, but information flow is also a type marker for organizational culture" (Westrum, 2004, p. ii23). Toft and Reynolds (1994) considered a safety culture as the appropriate environment for facilitating the information flow necessary to learn from adverse events. Reason (1998, p. 294) has characterized the intertwined nature of information and safety cultures:

"In the absence of frequent bad events, the best way to induce and then sustain a state of intelligent and respectful wariness is to gather the right kinds of data. This means creating a safety information system that collects, analyses and
disseminates information from accidents and near misses, as well as from regular proactive checks on the system's vital signs. All of these activities can be said to make up an informed culture—one in which those who manage and operate the system have current knowledge about the human, technical, organizational, and environmental factors that determine the safety of the system as a whole. In most important respects an informed culture is a safety culture.

The "information flow" to which these authors refer includes measurement of quantifiable safety and risk indicators as well as descriptive reports of both near misses and actual incidents involving harm or damage. In addition to the Bristol and Winnipeg inquiries, other studies and government-sponsored reports have emphasized the importance of such information for improving patient safety, at the same time pointing out the limitations of many current data-gathering approaches used in health care organizations (Baker & Norton, 2002; Institute of Medicine, 2003; Karson & Bates, 1999; Kohn et al., 1999; National Steering Committee on Patient Safety, 2002; Thomas & Petersen, 2003; Wald & Shojania, 2001). One of the major deficiencies explored in studies is the substantial underreporting of both adverse events and near misses (Stanhope, Crowley-Murphy, Vincent, O'Connor, & Taylor-Adams, 1999; Weingart, Ship, & Aronson, 2000). Researchers have linked underreporting to many of the cultural issues highlighted in previous sections, including fear of punishment or litigation (Leape, 1999; Wild & Bradley, 2005), as well as workload, lack of knowledge of how to report, disagreement about the necessity or utility of reporting (Vincent, Stanhope, & Crowley-Murphy, 1999), unwillingness to report unless a written protocol has been violated (Lawton & Parker, 2002), and variability in definition and interpretation of what constitutes a reportable "event" (Kaplan & Fastman, 2003; Sutcliffe, 2004; Tamuz, Thomas, & Franchois, 2004). In the Winnipeg inquest, the report notes that "[n]o member of the HSC [Health Sciences Centre] staff made use of the incident reporting system to flag any of the issues. Indeed, it is distressing that many staff members did not even believe that the reporting system applied to them" (Sinclair, 2000, p. 199). The Bristol report discusses many of the same barriers to reporting (Kennedy, 2001, p. 362).

Various recommendations have been put forward to improve the situation, including modeling reporting systems after those used successfully in other industries, such as aviation (Barach & Small, 2000; Billings, 1998; Thomas & Helmreich, 2002). To counter the cultural and institutional barriers, some argue that reporting should be voluntary, confidential, nonpunitive, and protective of those reporting, with an emphasis on capturing near misses (Barach & Small, 2000; Cohen 2000). These suggestions reflect both the tone and substance of the recommendations in the Bristol report (Kennedy, 2001, p. 370). However, Johnson (2003) warned that the expected benefits may be based on
overly optimistic assessments of experience in other industries and underestimation of the limitations of incident reporting, as well as the complexity of proper analysis of incidents. Leape (1999, 2000) expressed concern about the high costs of such systems and suggested that focused data collection and analysis methods may be more productive. On a more optimistic note, Kaplan and Barach (2002) proposed that staff participation in incident reporting, if properly supported, could contribute to the development of safety culture and mindfulness.

In addition to risk reports, traditional technical safety and risk management has also relied on codified knowledge such as policies and procedures to promote understanding of safety practice requirements. However, as discussed earlier, according to Gherardi and Nicolini (2000), it is not enough to have concrete policies, procedures, and indicator reports. Sustaining an informed safety culture also depends on understanding how members of an organization become part of a community, how they actually perform their work, and how they communicate information and knowledge. Weick (2002, p. 186) echoes this thought, referring to the danger of what Westrum, quoted in Weick (1995, p. 2), calls the “fallacy of centrality,” or

the belief that one is at the center of an information network, rather than just one interdependent player among many in a complex system. The reality is that systems have lots of centers, each with its own unique expertise, simplifications, and blind spots. It is the exchanging and coordinating of the information distributed among these centers that separates more from less intelligent systems. Systems that fail to coordinate effectively, and systems in which people assume that things they don't know about are not material, tend toward higher error rates. (Weick, 2002, p. 186)

An organization's cultures shape assumptions about what constitutes valid information and how it should be interpreted and transmitted (Choo, 2002; Turner & Pidgeon, 1997; Weick, 1995). Westrum (1992, p. 402) has put forth the argument that the very safety of an organization is dependent on a culture of “conscious inquiry,” which supports the early warning system alluded to in connection with effective information flows (see also Westrum, 2004). This is another way of stating Sinclair’s prescription for a culture that actively seeks and uses hazard information. A culture of conscious inquiry may be characterized as one in which “the organization is able to make use of information, observations or ideas wherever they exist within the system, without regard for the location or the status or the person or group having such information, observations or ideas” (Westrum, 1992, p. 402). This formulation brings to the fore the issue of information politics and the power that may be wielded by sharing or withholding information (Davenport, 1997). Individuals may be disenfranchised in a politicized information environment and
lack the influence to persuade those in power of the validity of their hazard information, with the result that their warning signals are not taken seriously (Ceci, 2004; Turner & Pidgeon, 1997).

Westrum (1992) characterizes organizations as pathological, bureaucratic, or generative, according to how well they “notice” information. In a more recent study, Westrum (2004, p. ii24) has elaborated on this typology by explaining that “the processes associated with fixing the hidden problems that Reason has called latent pathogens would seem strongly connected with information flow, detection, reporting, problem solving, and implementation.” He describes six types of responses to “anomalies” or indicators of problems (Westrum, 2004, p. ii25):

- Suppression—Harming or stopping the person bringing the anomaly to light; “shooting the messenger.”
- Encapsulation—Isolating the messenger, with the result that the message is not heard.
- Public relations—Putting the message “in context” to minimize its impact.
- Local fix—Responding to the present case, but ignoring the possibility of others elsewhere.
- Global fix—An attempt to respond to the problem wherever it exists. Common in aviation, when a single problem will direct attention to similar ones elsewhere.
- Inquiry—Attempting to get at the “root causes” of the problem.

Applying these categories to the Bristol and Winnipeg situations shows that both health care organizations responded to signs of problems through encapsulation and public relations, and possibly suppression. The concerns of the nurses in Winnipeg were at best encapsulated and more likely suppressed, largely through being ignored. Although he was not discouraged from collecting data on problems, the anesthetist in Bristol was told repeatedly to go away and verify his data. The poor outcomes cited in both cases were explained away and “put in context” by invocation of the learning curve, severity of cases, and low volumes, all of which precluded more generative responses such as a “global fix.”

Hudson (2003, p. i9) has adapted and expanded Westrum’s categories to describe the “evolution of safety cultures” from pathological through reactive, calculative, and proactive, to generative, driven by increasing levels of “informedness” and trust. Citing Reason (1998), he suggests that a safety culture is one that is based on learning and is informed, wary (vigilant), just, and flexible (Hudson, 2003, p. i9). These characteristics are reminiscent of the characteristics attributed to reliability-seeking organizations, as will be discussed in a later section. Generative
organizations are active in scanning, sensing, and interpreting and are more successful than pathological organizations at using information about adverse events. Bureaucratic (or calculative) information cultures may be as prone to information failures as pathological cultures. Although the behaviors may not be as overtly toxic to constructive sense making, information failures may nonetheless occur due to not-so-benign neglect and passivity, which may be inadvertently nurtured in a bureaucratic information culture. It appears that elements of pathological and bureaucratic information cultures were at work in Bristol. Those in leadership positions made it clear that problems were not welcome and that only solutions should be brought forward, thus taking a stance that “failed to encourage staff and patients to share their problems and speak openly” (Kennedy, 2001, p. 202).

Other researchers working outside the health care context have considered the interaction of culture and information handling. Brown and Starkey (1994, p. 808) stated that organizational culture “is an important factor affecting attitudes to, and systems and processes pertaining to, the management of information and communication.” Ginman (1987, p. 103) defined CEO (chief executive officer) information culture as “the degree of interest in information and the attitude to factors in the external company environment” and suggested a connection with business performance. In a similar vein, Marchand, Kettinger, and Rollins (2000, 2001) have described information orientation as a composite of a company’s capabilities to manage and use information effectively. According to them, information orientation is comprised of three categories of practices: information technology, information management, and information behaviors and values. The set of information behaviors and values includes integrity, or the absence of manipulation of information for personal gain (which relates to the issue of information politics noted earlier); formality, or the degree of use of and trust in formal information sources; control and sharing, or the degree of exchange and disclosure of information; proactiveness, or the degree to which members actively seek out information about changes in the environment; transparency, or the degree to which there is enough trust to be open about errors and failures (Marchand et al., 2000, p. 71). The last three information behaviors and values are clearly reflected in Westrum’s information culture characteristics.

Davenport (1997, p. 5) has identified information culture and behaviors as one of the elements of an organization’s information ecology, which “puts how people create, distribute, understand, and use information at its center.” He suggests that sharing, handling overload, and dealing with multiple meanings are three behaviors associated with successful information ecologies. Once again taking the obverse view, a pathological information organization may show evidence of inadequate sharing, overwhelming information overload, and inability to reconcile the multiple meanings of ambiguous hazard signals constructively, a situation consonant with Turner and Pidgeon’s (1997, p. 40) notion of the
“variable disjunction of information.” On the basis of the inquiry reports, it can be argued that many of these symptoms were in evidence in both Winnipeg and Bristol.

**The Role of Human Error Vs. Systems Thinking**

Because of the emphasis given to systems thinking and human factors analysis in both the Winnipeg and Bristol reports, it is important to show that these concepts relate to the health care context. Researchers have found that the gradual erosion of margins of safety in a system is attributable to various causes, for example, the design of the work environment and the pressure managers and staff may feel to take short cuts (Rasmussen, 1997; Reason, 1998; Sagan, 1993; Snook, 1996, 2000; van Vuuren, 1999, 2000; Vicente, 2004). Because safety tends to be equated with the absence of negative outcomes, “the associated information is indirect and discontinuous” (Reason, 1998, p. 4) so that the erosion is not evident until a catastrophic event occurs. The same pattern may well be occurring in cash-strapped hospitals, as the number of support staff is cut and more work is expected from fewer people, with nurses being expected to carry more responsibilities. Ironically, this is happening in the context of a serious nursing shortage, with the result that experienced nurses are in great demand and short supply. Novices have less practical experience and may have less access to adequate orientation and mentoring, and so may be in a vulnerable position. If learning, knowing, and collective mindfulness are the products of social construction and interaction, it is possible that cutbacks may disrupt occupational social networks and erode knowledge of safe practice (Fisher & White, 2000). Reason’s (1995, p. 80) systems and human factors approach to the role of human error suggests that these frontline staff at the “sharp end” of the systems may commit errors and violations, which he calls active failures, with immediately visible adverse effects or outcomes. However, Reason emphasizes that these sharp-end human failures or unsafe acts occur in the context of the conditions latent within the systems. The latent conditions result from, for example, managerial decisions concerning resource allocation and can include “poor design, gaps in supervision, undetected manufacturing defects or maintenance failures, unworkable procedures, clumsy automation, shortfalls in training, less than adequate tools and equipment” (Reason, 1997, p. 10). Such latent conditions build up over time, becoming part and parcel of the organizational context.

Vicente (2004) has applied human factors engineering—engineering that tailors the design of technology to people—to a broader set of problems that arises out of the interactions and relationships between people and technology. He developed a conceptual framework based on a systematic analysis of the principles that govern human behavior, which can be organized into five levels: physical, psychological, team, organizational, and political. The **physical** level refers to how individuals differ
in their physiology, strength, dexterity, and other capabilities. The psychological level includes our knowledge of how human memory works, how we make sense of situations, and how we seek and use information. The team level focuses on the communication and coordination activities of the group, comprising both the advantages and drawbacks of teamwork. The organizational level covers a range of factors, including organizational culture, leadership, reward structures, information flows, and staffing levels. Decisions made at the organizational level can have important effects at the lower levels: for example, when the number of nurses assigned to a hospital ward is too low, the workload of the individual nurse may push his or her psychological ability to cope to a breaking point (Vicente, 2004). The topmost level is the political, where basic considerations include public opinion, social values, policy agendas, budget allocations, laws, and regulations. This hierarchy of levels forms what Vicente (2004, p. 52) calls “the Human-Tech ladder.” In this model, design should begin by understanding a specific human or societal need (e.g., public health, transportation, counterterrorism), identifying the levels that need to be considered, and then tailoring the technology or system to reflect, and fit with, the human factor principles at each of these levels. At lower levels (for example, when designing a toothbrush), design is concerned with achieving a good fit between physical and psychological factors. However, when we are designing large-scale social systems within which people and technology interact, it becomes necessary to consider higher-level factors such as authority relationships, staffing policies, laws, and regulations. Vicente used this model to analyze a number of cases and systems in health care, nuclear power, aviation, the environment, and other safety-critical sectors.

Rasmussen (1997, p. 189) presented a behavioral model of accident causation focusing on “a natural migration of work activities towards the boundary of acceptable performance.” In any work system, human behavior is shaped by multiple objectives and constraints. Within these targets, however, many degrees of freedom are left open, allowing groups and individuals to search for work practices guided by criteria such as workload, cost-effectiveness, risk of failure, and joy of exploration. This search space is defined by four important boundaries: (1) a boundary to economic failure (beyond which work is not being done cost-effectively), (2) a boundary to unacceptable workload, (3) a boundary specified by official procedures, and (4) a safety boundary beyond which accidents can occur. Over time, work practices drift or migrate under the influence of two sets of forces resulting in two gradients. The first gradient moves work practices toward least effort, so that the work can be completed with a minimum of mental and physical effort. The second gradient is management pressure that moves work practices toward cost-effectiveness. The combined effect is that work practices drift toward the boundary of safety. In order to improve the safety of skilled activities, Rasmussen (1997, p. 192) suggested that rather than attempting to control behavior and stop the natural migration of work practices,
the most promising general approach to improved risk management appears to be an explicit identification of the boundaries of safe operation together with efforts to make these boundaries visible to the actors and to give them an opportunity to learn to cope with the boundaries.

Researchers have also applied human error theory and prevention methods in health care delivery (Berwick, 1998a, 1998b; Bogner, 1994; Cook et al., 1998; Edmondson, 1996; Feldman & Roblin, 1997; Kohn et al., 1999; Leape, 1997; Taylor-Adams, Vincent, & Stahnope, 1999). Knowledge of the role of latent conditions and systemic causes is important for understanding adverse events, yet hindsight bias tends to encourage blinkered vision and foster short-sightedness. How well these concepts are understood and how widely they are believed may be critical dimensions of cultural knowledge in a health care organization (van Vuuren, 2000). This is also reflected in the categories that Pidgeon (1991) uses to identify the main elements of safety culture: norms and rules for dealing with risk, safety attitudes, and the capacity to reflect on safety practices.

Vulnerability and Failures or Resilience and Avoidance?

In addition to human factors research, studies of disasters and accidents in other industries have developed a rich literature on safety and human error in complex environments (Carroll, 1998; Perrow, 1999a, 1999b; Reason, 1990, 1998; Rochlin, 1999; Turner & Pidgeon, 1997). As noted in the introduction, three conceptual approaches have been developed to explain disaster prediction and avoidance: (1) Turner's (1978, p. 1) "man-made disasters" or disaster incubation theory (Turner & Pidgeon, 1997), (2) Normal Accident Theory (Clarke & Perrow, 1996; Perrow, 1999a), and (3) High Reliability Theory (LaPorte & Consolini, 1991; Roberts, 1990, 1993; Rochlin, 1999; Weick & Roberts, 1993). There are several reasons for considering this work here. The information failures and vulnerabilities described in the Winnipeg and Bristol reports echo many of the points made by Turner in his study of accident inquiry reports, and he contributes a theoretical model to explain such events. Recommendations in both reports stress the need to develop skills in teamwork and the ability to intervene in, and recover from, errors (Kennedy, 2001, p. 276; Sinclair, 2000, p. 497). These skills are reflected in the concepts of resilience and reliability, which have been considered in great detail by those studying reliability-seeking organizations.

"Man-Made Disasters"

Turner's remarkable Man-Made Disasters (Turner & Pidgeon, 1997) was ahead of its time in presenting a sociotechnical model of system vulnerability and was not fully appreciated for a number of years (Short &
In this work, Turner analyzed 84 British Government inquiry reports on disasters and accidents published between 1965 and 1975. The disasters included an unexpected array of situations with a wide range of factors and outcomes: mining and boiler explosions, marine wrecks, building collapses and fires, and a level-crossing collision. It is interesting to note that two of the accident inquiries dealt with the use of contaminated infusion fluids in a hospital and a smallpox outbreak in London.

As regards the themes of this chapter, Turner emphasized the significance of individual and organizational cultural beliefs and the social distribution of knowledge related to safety, hazards, and the adequacy of precautions. One of Turner's key observations is that disasters result from a failure of foresight and an absence of some form of shared knowledge and information among the groups and individuals involved. Sense making can be complicated by a "variable disjunction of information," that is, "a complex situation in which a number of parties handling a problem are unable to obtain precisely the same information about the problem, so that many differing interpretations of the situation exist" (Turner & Pidgeon, 1997, p. 40). To draw the parallel with Bristol and Winnipeg, neither organization used effective mechanisms to bring the appropriate individuals together to review concerns about surgical outcomes. In Bristol, there were data available but "all the data were seen in isolation" without agreed-upon standards (Kennedy, 2001, p. 236). The data "lent themselves to a variety of interpretations, not all of which pointed to poor performance ... and data were rarely considered by all members of the team together" (Kennedy, 2001, p. 240).

In considering Turner's "variable disjunction of information," Weick (1998, p. 74) has pointed out that the tendency of people to satisfice ("make do with what information they have") and to simplify interpretations (so as to be able to construct coherence from the variable and patchy information they have) creates collective blind spots that can impede perception of potential problems. Lea, Uttley, and Vasconcelos (1998) analyzed similar problems of information and interpretation that occurred in the Hillsborough Stadium disaster, using Checkland's (1999) Soft Systems Methodology to map the conflicting views of those involved in the ambiguous problem situation.

Turner's model proposes multiple stages of disaster development that can unfold over long periods of time. As Hart et al. (2001, p. 185) have pointed out, "the process nature of crises should be stressed ... they are not discrete events, but rather high-intensity nodes in ongoing streams of social interaction." The model suggests that disasters involve an element of great surprise for the majority of individuals involved or affected because they hold certain inaccurate beliefs in the initial stage—(1) that adequate safety precautions are in place, (2) that no untoward events are occurring, and (3) that the appropriate individuals are fully aware of any information that would indicate otherwise. Turner emphasized that disasters can have a prolonged incubation period during which events
that are at odds with existing beliefs begin to accumulate in the environment, creating chains of unrecognized errors. During the "predisclosure" incubation period in stage two, the events may be ambiguous, unknown, or misunderstood, resulting in vague or ill-structured problem situations that are replete with information difficulties. Post-disclosure, after a transfer of information caused by a precipitating adverse event (stage three), the situation appears to be quite different and, with the benefit of hindsight, presents itself as a well-structured, recognizable problem (stages four to six). Hindsight bias can pose major problems during the efforts to piece together events after the fact, for example, during an inquiry (Henriksen & Kaplan, 2003). The ambiguity of situations facing individuals in the incubation stage is retrospectively minimized and the interpretation of events may be unwittingly (or deliberately) incomplete and/or politically driven (Brown, 2000, 2004; Gephart, 1984, 1992), as participants jockey to have their respective versions of the events accepted. The risk of hindsight bias was well recognized and articulated in the Bristol report, which discusses the problem explicitly (Kennedy, 2001, p. 36). In an ideal case, the transformation from the problematic pre-disclosure state to the well-structured post-disclosure state would be accomplished with the transfer of appropriate warning information. However, Rijpma (2003) has recently pointed out that, according to Perrow (1981), this ideal transfer is not likely to occur because the ambiguous and mixed signals are interpreted and labeled as warning information only with the benefit of hindsight.

Although the disasters he studied were ostensibly very different, Turner identified common features and similarities that form the basis of the man-made disasters model (Turner & Pidgeon, 1997, pp. 46–60):

1. Rigidity in perception and pervasive beliefs in organizational settings, including cultural and institutional factors that bias members' knowledge and ignorance
2. A decoy problem that distracts attention from the actual causal conditions brewing beneath the surface
3. Organizational exclusivity, which causes the organization to ignore outsiders' warnings
4. Information difficulties
   • Relevant information may be buried in a mass of irrelevant information
   • Recipients may fail to attend to information because it is only presented at the moment of crisis
   • Recipients may adopt a "passive" mode of administrative response to an issue
Recipients may fail to put information together creatively

5. Involvement of "strangers," especially on complex sites
6. Failure to comply with existing regulations
7. Minimization of emergent danger

Turner's view of information difficulties is particularly interesting. The information in question is some form of danger sign, signal, or warnings that could potentially prevent a disaster. Information-handling difficulties can arise at any point in the development of a disaster—during the pre-disclosure incubation phase, during information transfer, and during post-disclosure—and arise from many different factors. Some difficulties relate to the nature of the signals and information itself, some depend on the characteristics of the people involved, some arise from the context or environment, yet others relate to steps in the process of information handling. In their review of a dozen examples of "great information disasters," Horton and Lewis (1991, pp. 1, 204) describe similar information difficulties as being the result of "dysfunctional information attitudes and behaviors."

Turner suggests that culture is a common influence shaping all information-handling difficulties, as was found to be the case in the Bristol and Winnipeg inquiries. He asserts that organizational culture affects the use and transfer of information by creating assumptions about what is given value as information, how it is to be communicated, and what can be ignored. "A way of seeing is always also a way of not seeing" is Turner's apt synopsis (Turner & Pidgeon, 1997, p. 49). Organizational failure of perception and collective blindness to issues may be "created, structured, and reinforced by the set of institutional, cultural, or sub-cultural beliefs and their associated practices" (Turner & Pidgeon, 1997, p. 47). The culturally sustained assumptions affect both the sense-making and decision-making processes, as "organizations strive to reduce noise, equivocation, information over-load and other ambiguous signals to politically secure and actionable messages" (Manning, 1998, p. 85). Wicks (2001) has taken a different theoretical path by emphasizing the role of institutional pressures rather than culture in organizational crises, but with similar results in terms of information breakdown. In his analysis of the Westray Mines explosion, he argues that the institutional antecedents can create a "mindset of invulnerability" that in turn creates inappropriate perception and management of risks (Wicks, 2001, p. 660). In a similar analysis of an Australian mine explosion, Hopkins (1999, p. 141) found a "culture of denial" that minimized warning signals, leading to a belief that such accidents could not happen in that venue. This was compounded by a "hierarchy of knowledge" that in this setting privileged personal experience over information from others (Hopkins, 1999, p. 141). The company managers also relied heavily on
oral rather than written communication, so that written reports were ignored and issues that were communicated orally ran the risk of being forgotten.

Internal and external environmental conditions can change, creating a discrepancy between organizational assumptions and the environment. This highlights the need for environmental scanning to identify signs of hazards—a form of organizational early warning information system to support organizational intelligence and sense making (Choo, 2002).

In studying the origins of disasters, therefore, it is important to pay attention, not just to the aggregate amount of information which is available before a disaster, but also to the distribution of this information, to the structures and communication networks within which it is located, and to the nature and extent of the boundaries which impede the flow of this information. Of particular interest are those boundaries which, by inhibiting the flow of this information, may permit disasters to occur. (Turner & Pidgeon, 1997, p. 91)

In sum, Turner's seminal work firmly established the importance of culture—that is, beliefs, values, and norms—in the occurrence of information failures and accidents.

**Normal Accidents and High Reliability**

Perrow's Normal Accident Theory suggests that accidents are an inevitable risk inherent in the tightly coupled and complex nature of technology-dependent systems such as nuclear or chemical plants (Perrow, 1999a). The complex nature of the functioning of these technologies can be opaque to the people charged with their maintenance and operation. This makes it almost impossible to intervene successfully when something goes wrong, unless redundancies are built into a system from the beginning (Perrow, 1999b). Interacting failures move through complex systems quickly when components have multiple functions and are closely tied to one another (Rijpma, 1997). The nature of the technology itself paves the way for unavoidable accidents. In addition, the tendency to blame individuals, the difficulty of comprehending the complexity of events in retrospect, and reluctance to report incidents make learning unlikely (Clarke & Perrow, 1996; Mascini, 1998; Perrow, 1999a).

Taking a different position are the proponents of reliability-seeking organizations (or High Reliability theorists), who argue that Normal Accident Theory is based on an overly structural view of organizations (Roberts, 1993). High Reliability theorists shift the emphasis from structure and technology to the culture and interactive processes of groups responsible for carrying out the work. They have studied exemplary aircraft carriers and nuclear plants that successfully balanced production
with protection. Using the example of operations on the flight deck of an aircraft carrier, Weick and Roberts (1993) explored the concept of collective mental processes and how they mediate performance. Like Gherardi and Nicolini (2000), Weick and Roberts also drew on Lave and Wenger's (1991) concepts of legitimate peripheral participation and learning in communities of practice. They focused on the connections among the behaviors of individuals working together as an interdependent system to create a pattern of joint action (Weick & Roberts, 1993 p. 360):

Our focus is at once on the individuals and the collective, since only individuals can contribute to a collective mind, but a collective mind is distinct from an individual mind because it inheres in the pattern of interrelated activities among many people.

The intelligent, purposeful, and careful combination of collective behaviors constitutes "heedful interrelating" (Weick & Roberts, 1993, pp. 361, 364). The more developed the heedful interrelating among the members of a group, the greater the capacity to deal with nonroutine events. As a corollary, if the activities of contributing, representing, or subordinating are carried out carelessly, then adverse results can occur (Weick & Roberts, 1993, p. 375). The Winnipeg and Bristol inquiries showed that the care teams had not been able to achieve this level of functioning and communication, thus impairing their ability to recover when problems arose with the cases during surgery and post-operatively (Kennedy, 2001, p. 214; Sinclair, 2000, pp. 475, 496).

Weick (2001, p. 307) has described reliability as a "dynamic non-event," because organizations must continuously manage and adapt to a changing and uncertain environment while producing a stable outcome, the avoidance of accidents. Weick, Sutcliffe, and Obstfeld (1999) highlight five key characteristics that allow reliability-seeking organizations to achieve this end. Weick (2002) suggests that the same characteristics may be usefully cultivated in hospitals. The first is preoccupation with failure. Reliability-seeking organizations anticipate that problems will occur and remain vigilant to the possibilities. They learn as much as possible from near misses and reward staff for reporting them. Second is reluctance to simplify interpretations. Because the task environment can be ambiguous and problems ill-structured, such organizations foster diverse viewpoints and interpretations, thus developing "conceptual slack" to avoid blind spots (Schulman, 1993, p. 346). Similarly, Westrum (1992) has suggested that requisite imagination is needed to anticipate problems, while Pidgeon and O'Leary (2000, p. 22) refer to developing "safety imagination." The third is continuous sensitivity to operations. Reliability-seeking organizations work on maintaining collective situational awareness, alert to the fact that this can be eroded by work overload and pressures to produce services. The next characteristic is commitment to resilience. The organizations provide continuous training
so that teams can learn to contain the effects of errors and deal with surprises effectively. By contrast, in Winnipeg the nurses made repeated requests for orientation and practice runs through routines with the new surgeon, but these went unanswered (Sinclair, 2000, p. 132). The last characteristic is underspecification of structure. Paradoxically, although aircraft carriers have a clear military hierarchy, they combine this with decentralized decision making and problem solving and so possess the flexibility to link expertise with problems as needed. Once again by contrast, in Bristol responsibilities were delegated to a great degree, but without attendant decision-making powers. The result was that rigid organizational hierarchy was combined with unclear lines of authority and suppression of communications, all of which impaired the ability to solve problems (Kennedy, 2001, p. 201). Similar confusion about responsibilities eroded the situation in Winnipeg (Sinclair, 2000, p. 471).

Weick et al. (1999) have further elaborated the concept of reliability and collective mindfulness, emphasizing the need for ongoing readjustment in the face of unusual events. “Continuous, mindful awareness” means knowing how to keep track of and respond to those variations in results “that generate potential information about capability, vulnerability, and the environment” (Weick et al., 1999, p. 88). “If people are blocked from acting on hazards, it is not long before their ‘useless’ observations of those hazards are also ignored or denied, and errors cumulate unnoticed” (Weick et al., 1999, p. 90). Rochlin (1999) has pointed out the dangers of stifling or ignoring staff members’ observations when what is really needed is active nurturing of early warning systems. A hospital “grapevine” may well carry such information, but the organizational cultures of the hospital may not support its effective use. In Winnipeg, the inquest noted that “managers ignored pertinent information that was brought to their attention, and at best, simply tolerated the bearers of bad news” (Sinclair, 2000, p. 485). When variations and anomalies are ignored or internalized and simply accepted, an organization creates the normalization of deviance, such as that which contributed ultimately to the failure of the Challenger launch (Vaughan, 1996). Weick and Sutcliffe (2003, p. 73) have described the situation that existed in Bristol as a “culture of entrapment,” by which they mean “the process by which people get locked into lines of action, subsequently justify those lines of action, and search for confirmation that they are doing what they should be doing.” The mindset that prevailed in Bristol and in Winnipeg accepted the learning curve, low numbers of patients, and the complexity of the case mix as explanations for the poor outcomes. Weick and Sutcliffe use a theory of behavioral commitment to explain why that mindset endured for so long.

Rijpma (1997, 2003) has given a critical assessment of the disagreements between Normal Accident Theory and High Reliability Theory researchers, observing that the ongoing debates between the camps have not produced definitive conclusions and may not have been as theoretically productive as might have been expected. Schulman (2002) has
questioned the direct applicability of reliability theory derived from high-hazard operations to health care organizations. He points out that medical care is unlike nuclear power or air traffic control and that the reliability challenges differ in complex ways. The immediate impact of a failure is usually limited to a patient (not large numbers of people outside the organization), so that there may be fewer voices calling for change. There is a conflict of goals inherent in the context of limited resources: “If we organize to be more reliable, this must come at some cost to another value—speed, output, or possibly efficiency” (Schulman, 2002, p. 201). Given the demand for medical services, risk of failure at some level seems to have been accepted as inevitable. The Bristol report illustrates this with its description of the National Health Service as having a culture of making-do and muddling through in the hope that things might eventually improve (Kennedy, 2001, p. 4).

Conclusions

The goal of this chapter has been to show how failures in handling information can contribute to the occurrence of adverse events and failures in health care settings. The extensive inquiries into the care of pediatric cardiac surgery patients in Winnipeg and Bristol provided a catalogue of telling examples to illustrate how this happens. In explaining why such failures happen, research has pointed to the roles played by culture, human factors, and systems analysis.

Researchers have suggested that culture is a central influence on how information is or is not used for the purposes of learning and patient safety in health care organizations. As Westrum (2004, p. ii22) defines it, culture is “the patterned way that an organisation responds to its challenges, whether these are explicit (for example, a crisis) or implicit (a latent problem or opportunity).” Organizational and professional cultures can make it difficult to achieve a safe environment with appropriate reporting and use of information about risks and hazards. The values, norms, and assumptions that shape the response to information about problems include, for example, the status of particular disciplines (who holds authority) and norms of individual responsibility and blame. Hierarchical structures of health care disciplines can create silos that undermine communication and teamwork. The traditional emphasis on individual responsibility for adverse events combined with a propensity to “blame and shame” can create a context of fear. In such an environment, the personal costs of admitting mistakes are far greater than the incentives to report errors and mishaps. How an organization responds to information about problems or “bad news” is indicative of its culture; pathological cultures suppress such information and punish the messengers, whereas generative cultures actively encourage and reward such reporting (Hudson, 2003; Westrum, 1992, 2004).

Research in human factors and systems analysis has contributed important insights into the context and genesis of health care failures.
There is growing recognition of the contribution of latent systems factors to clinical mishaps. Individual health care providers are usually the last connection in the chain of events that results in an adverse outcome. They are at the “sharp end” of the system, the last and most visible connection to the patient and the most likely target for fault-finding (Reason, 1995, p. 80). The propensity to blame individuals for issues that should be investigated as failures of the system has made learning from adverse events more difficult. In such circumstances, potential information about systemic causes is often overlooked because investigations of health care failures do not focus on, and gather, the appropriate data.

Based on research into reliability-seeking organizations, recommendations to improve patient safety fall into several categories. At the system level, one common recommendation is to build system-wide capacity for learning and constant monitoring for problems by encouraging confidential reporting and analysis of near misses and incidents. At the local level, another recommendation is to build the capability of teams to be vigilant and questioning in all situations, and resilient and able to respond flexibly to contain problems if and when they occur. Toft and Reynolds’s (1994, p. xi) description of “active foresight” provides an articulate synopsis of both the challenges and the goal to be achieved in improving the handling of information:

By developing systems that feedback information on accident causation it should be possible to help prevent future recurrence of similar disasters. This information feedback requires an appropriate environment—a safety culture—which allows the formation of “active foresight” within an organization. Active foresight has two elements—foresight of conditions and practices that might lead to disaster and active implementation of remedial measures determined from that foresight. The analysis of organizations and people involved in disasters should not be focused on considerations of culpability or censure, but on acquiring information for the feedback process. The lessons of disasters arise at great cost in terms of human distress and damage to the living environment. We owe it to those who have lost their lives, been injured, or suffered loss to draw out the maximum amount of information from those lessons, and apply it to reduce future suffering.

Endnotes
References


